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2016 AQ Summit: Innovation Update by Anthony Viselli

Anthony Michael Viselli

THE UNIVERSITY OF MAINE

ADVANCED STRUCTURES & composites center

Federally Funded W² Wind-Wave Test Basin to Support the Aquaculture Industry

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Outline

1. UMaine Advanced Structures and Composites Center
2. W^2 Wind Wave Basin
3. Facility capabilities
4. Why is model testing important?
5. Target technologies
6. W^2 equipment
7. Commissioning Testing
8. Rapid Prototyping
9. Questions

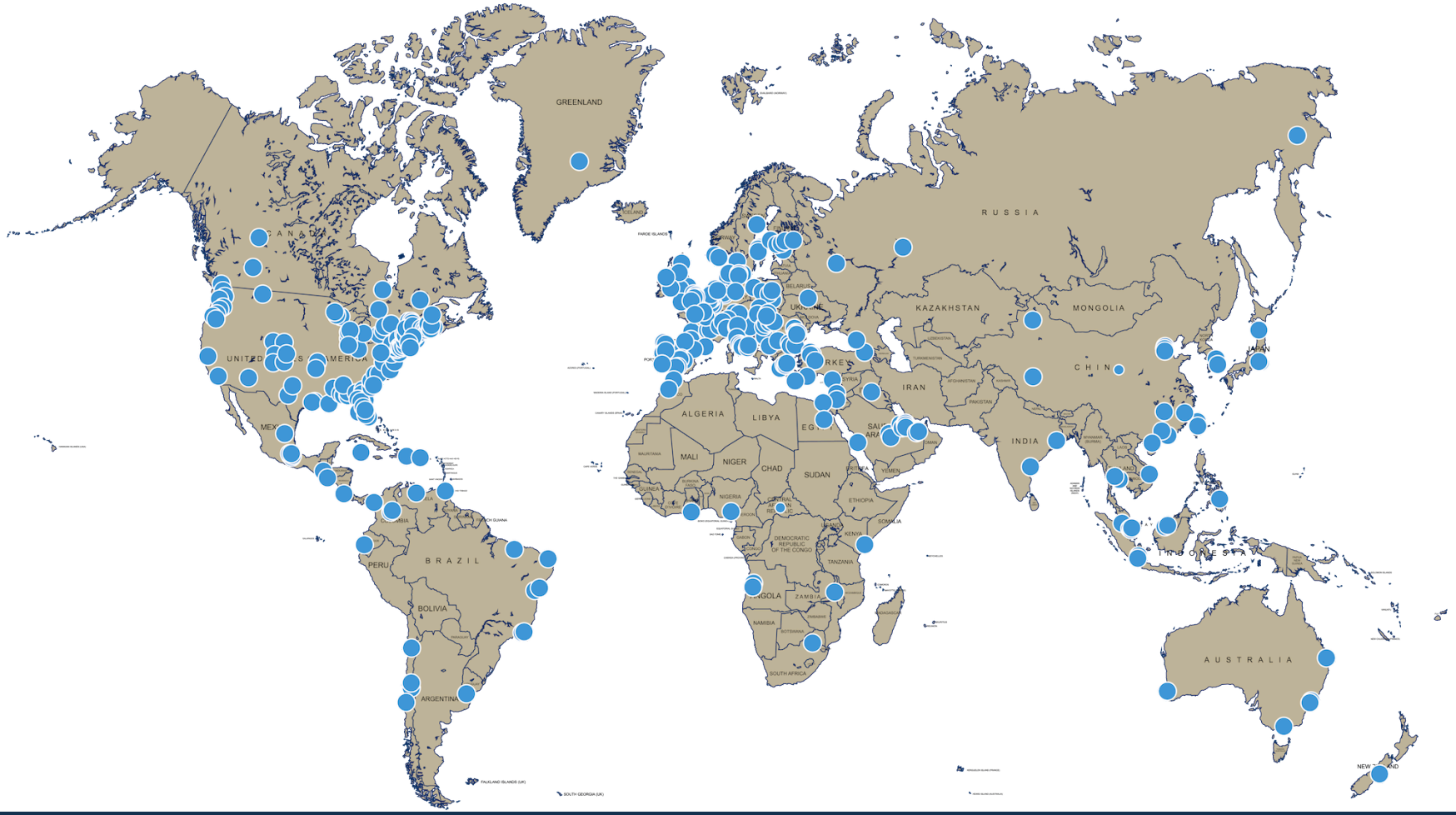
Bringing Advanced Materials into Construction

- Founded though the NSF in 1996
- 180 faculty, staff and students/ year
- 100,000 ft^2 lab
- 1,700+ students funded from 35+ majors at UMaine

Since our founding in 1996:

- $8.07M/year external funding last four years
- 500+ clients including 150 Maine-based companies.
- 14 spinoffs companies created
- 31 patents granted + 12 pending.

>500 Clients & Partners



Over $110 Million R&D to Maine

Major Funding Agencies:

NSF

US ARMY NATICK SOLDIER RD&E CENTER

NASA

NIST National Institute of Standards and Technology U.S. Department of Commerce

mti Maine Technology Institute *Investing in Innovation*

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

U.S. DEPARTMENT OF HOMELAND SECURITY

U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER ERDC

Awards & Honors

39 state, national and international excellence awards for our R&D, including:

ACEC
American Council of Engineering Companies

2011 Engineering Excellence

ACMA
American Composites Manufacturers Association

2010 Most Creative Product
2007 People's Choice
2007 Best of Show

ASCE
American Society of Civil Engineers

2011 Charles Pankow Award for Innovation

MAINE DEVELOPMENT FOUNDATION

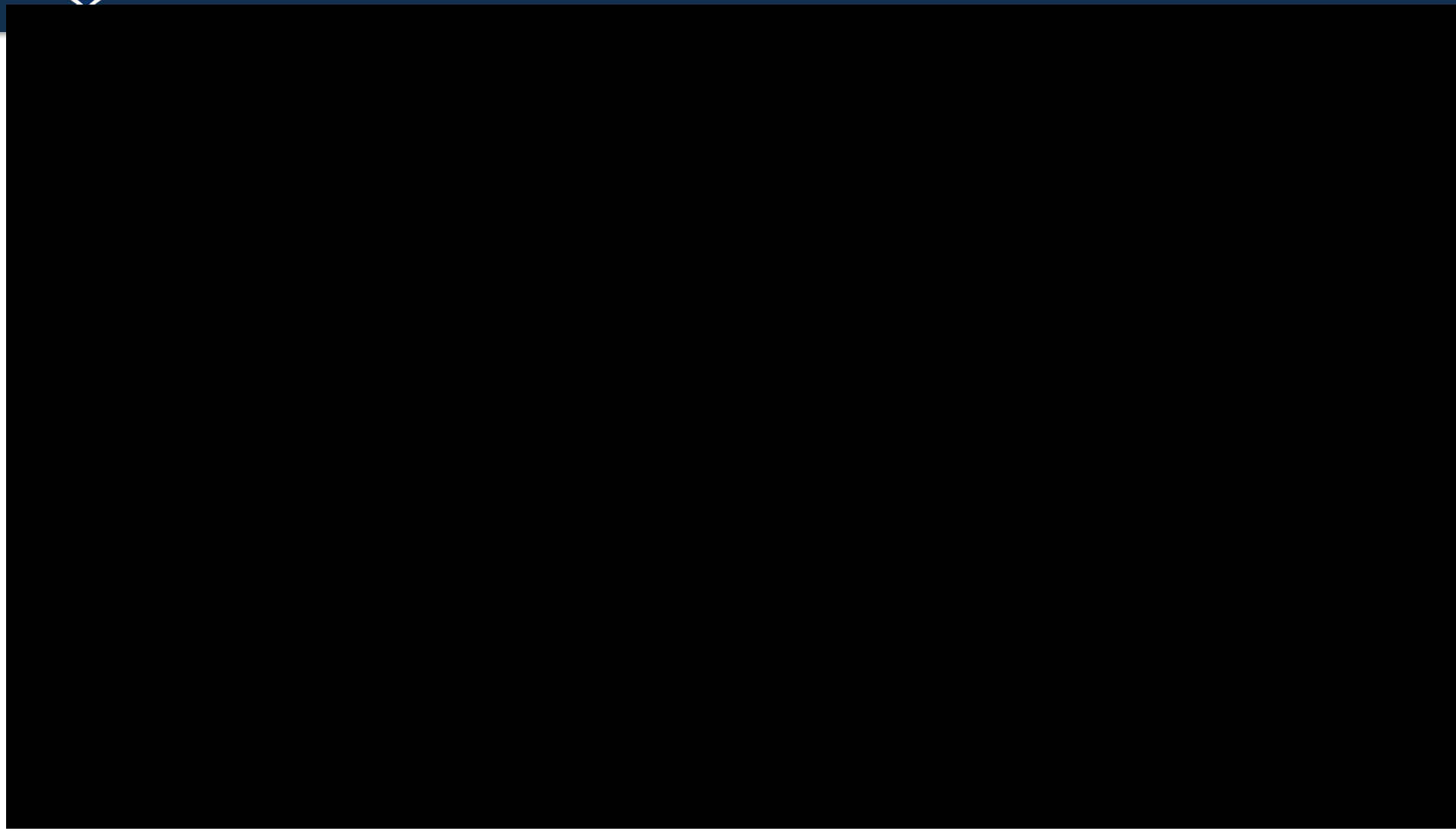
2008 "Champion of Economic Development"

Spinoff Company Example

MAKO is an 83 foot, all-composite hull, special operations vessel.

Offshore Wind

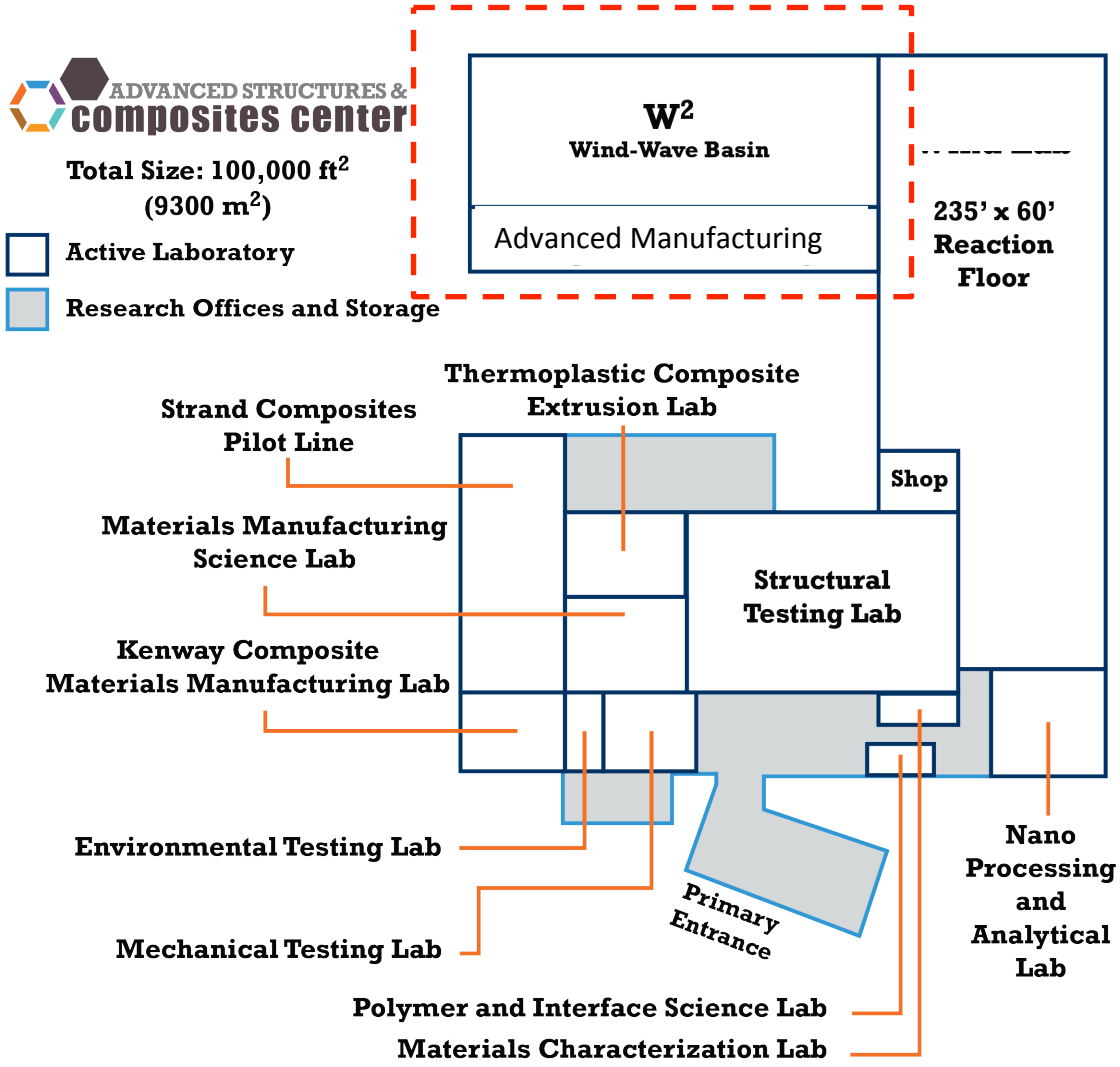
50-Year Storm



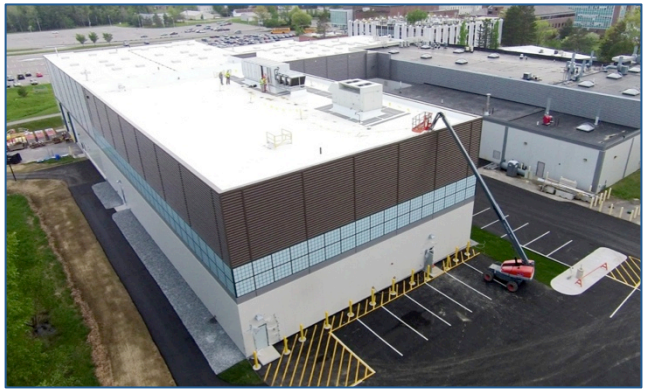
Ocean Engineering and Advanced Manufacturing Laboratories

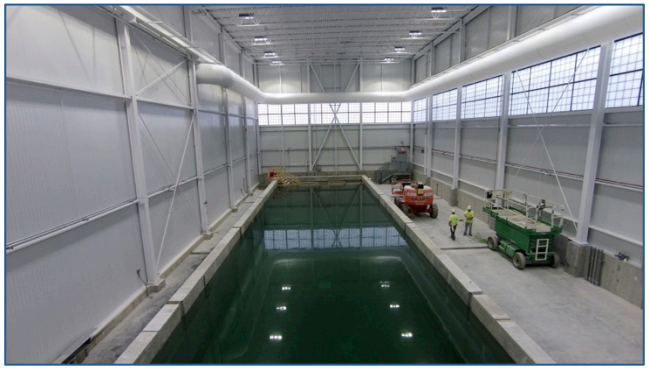
- Strengthen Ocean Economy
- Strengthen Digital and Additive Manufacturing

mti Maine Technology Institute
Investing in Innovation



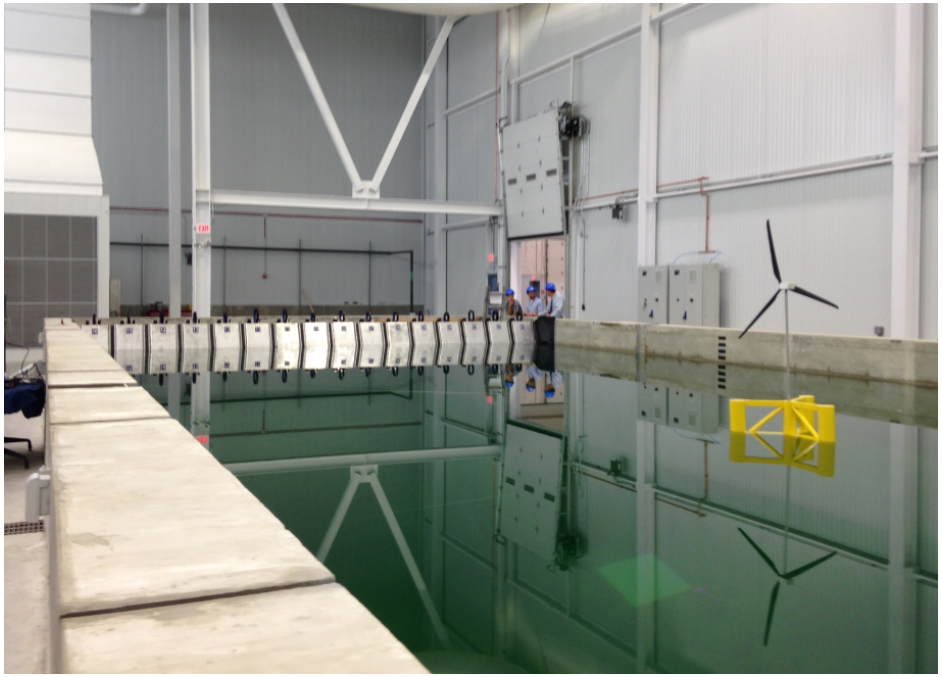
W² Wind-Wave Basin





Why do scale model testing?

- New technology development
- Risk reduction
- Design concept verification
- Class requirements
- Client requirements
- Understand the interaction between the structure and the environment (wind, waves and current)

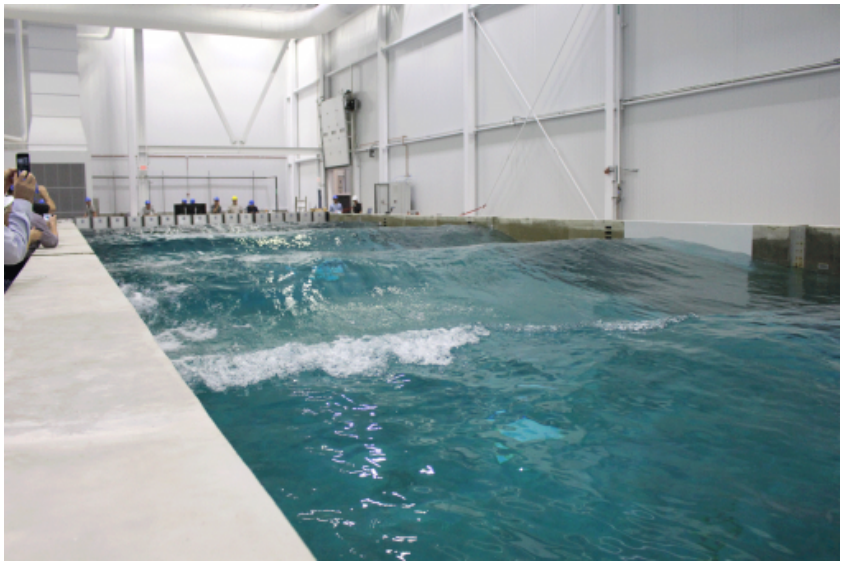


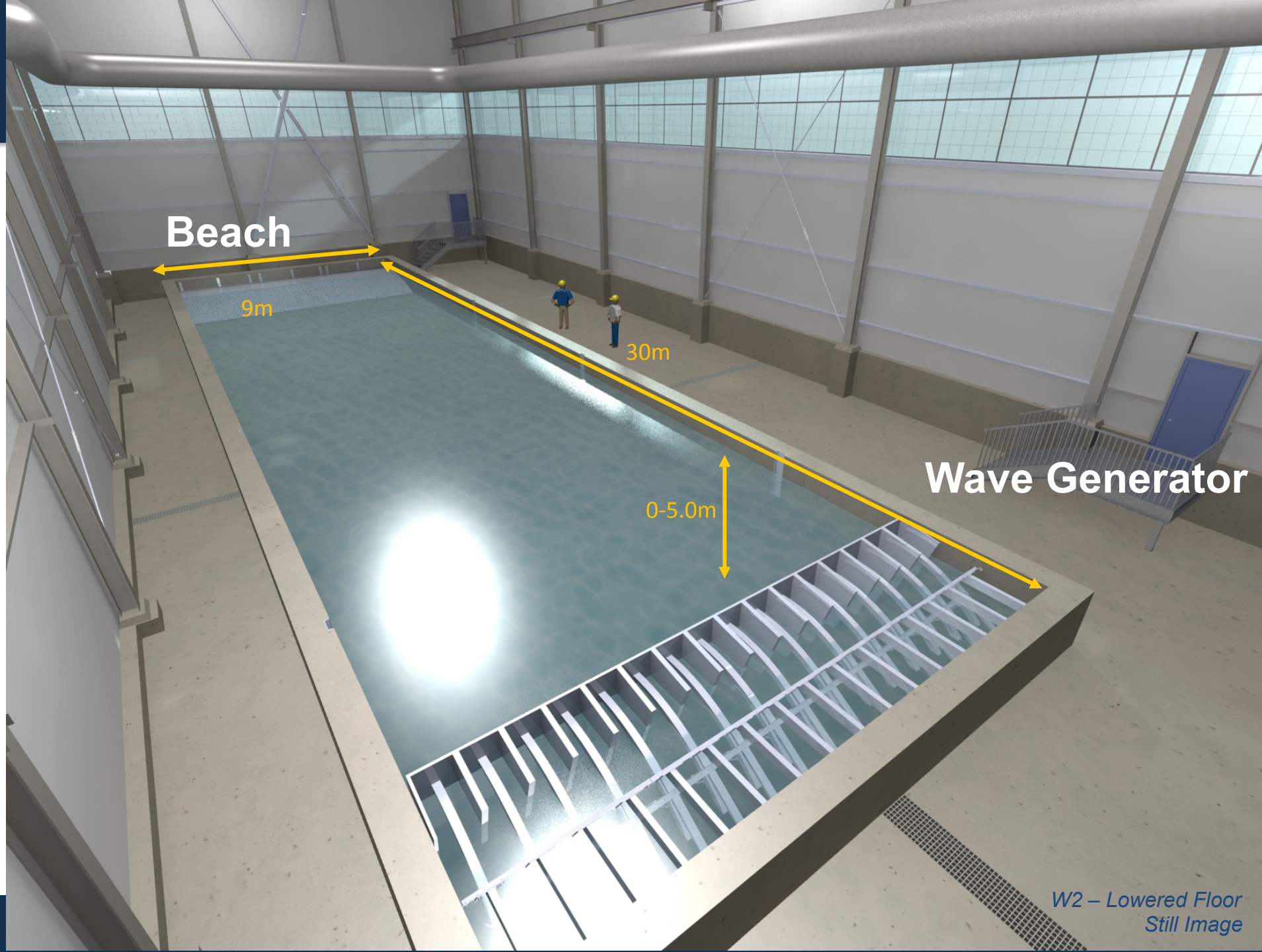
Target Technologies for Testing

- Aquaculture
  - Equipment
  - Structures
  - Operations and O&M
  - Vessels
- Offshore Wind
  - Fixed or floating
  - Combined with other renewable energy systems
- Oil and Gas
- Ship Structures
- Wave Energy Devices
- New installation and launch methods
- O&M operations

W² Basin Capabilities

- Advanced facility for simulating wind and wave conditions
- Calm to Storm seas
- Directional winds
- Changing water depths
- Towing operations





W2 – Lowered Floor
Still Image

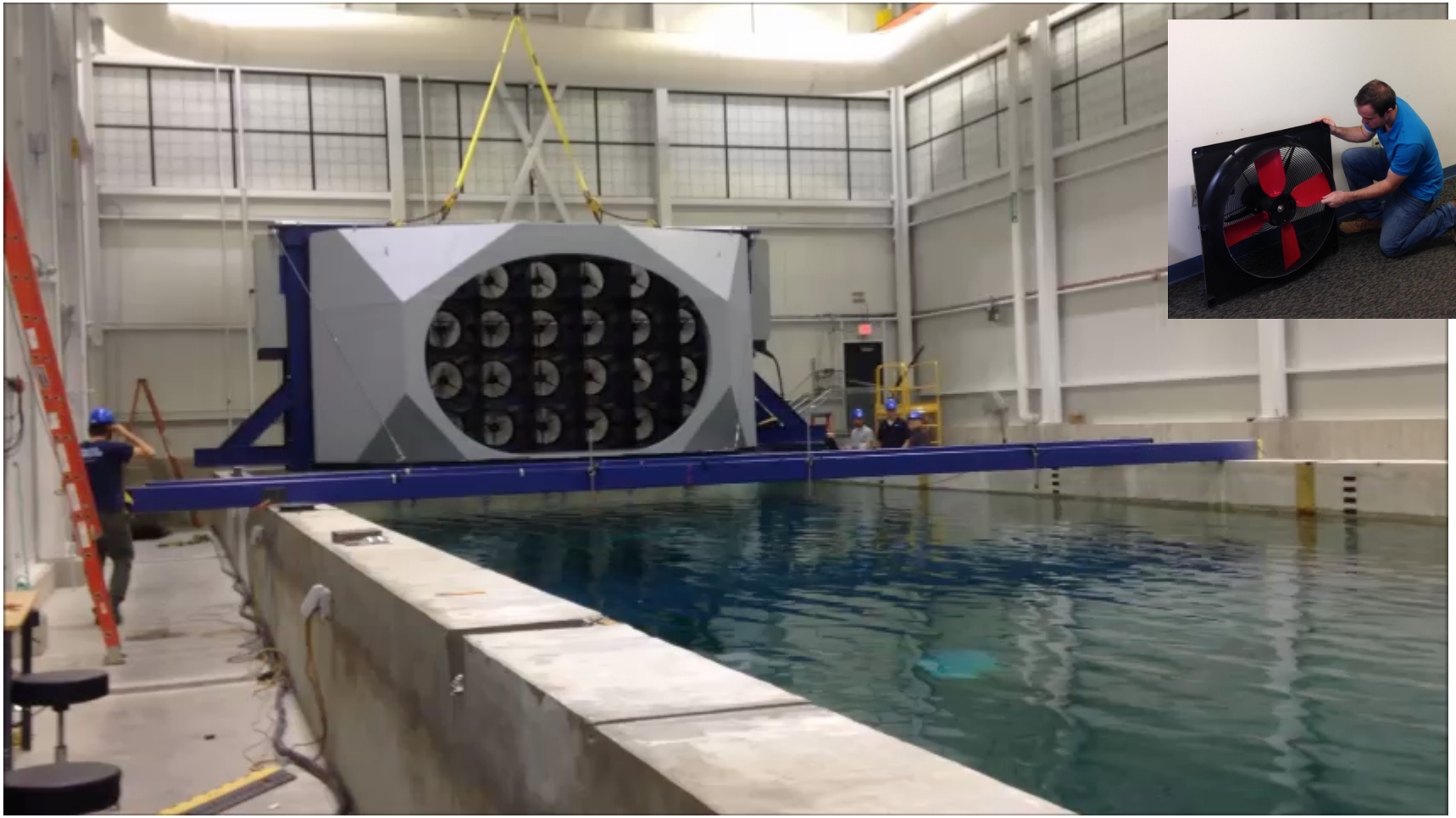
Ocean Engineering Basin: W^2

video

Wind Wall

~0-15m/s (42mph) at 1:50 scale

~0-105m/s (240mph) at full-scale

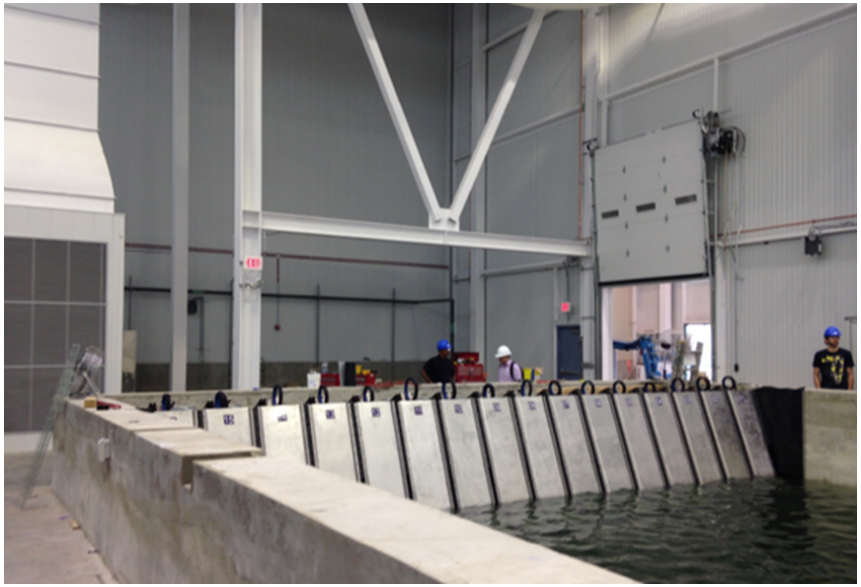


New vessel designs

W2 – America's Cup
Still Image

The W² wave maker system

- 16 paddle wavemaker.
- Manufactured and installed by Edinburgh Designs Ltd. UK
- Regular or random seas and directional waves, range of frequencies.
- Max height:
  - 0.6 m (24 in) at T = 1.65 sec
  - 0.8 m (30 in) at T = 2.30 sec
  - Assuming 1:50 scale, equates to 40m wave!
- Regular waves and all standard spectra in addition to custom random seas
- Wave angles in excess of +/- 60 degrees relative to the basin center line



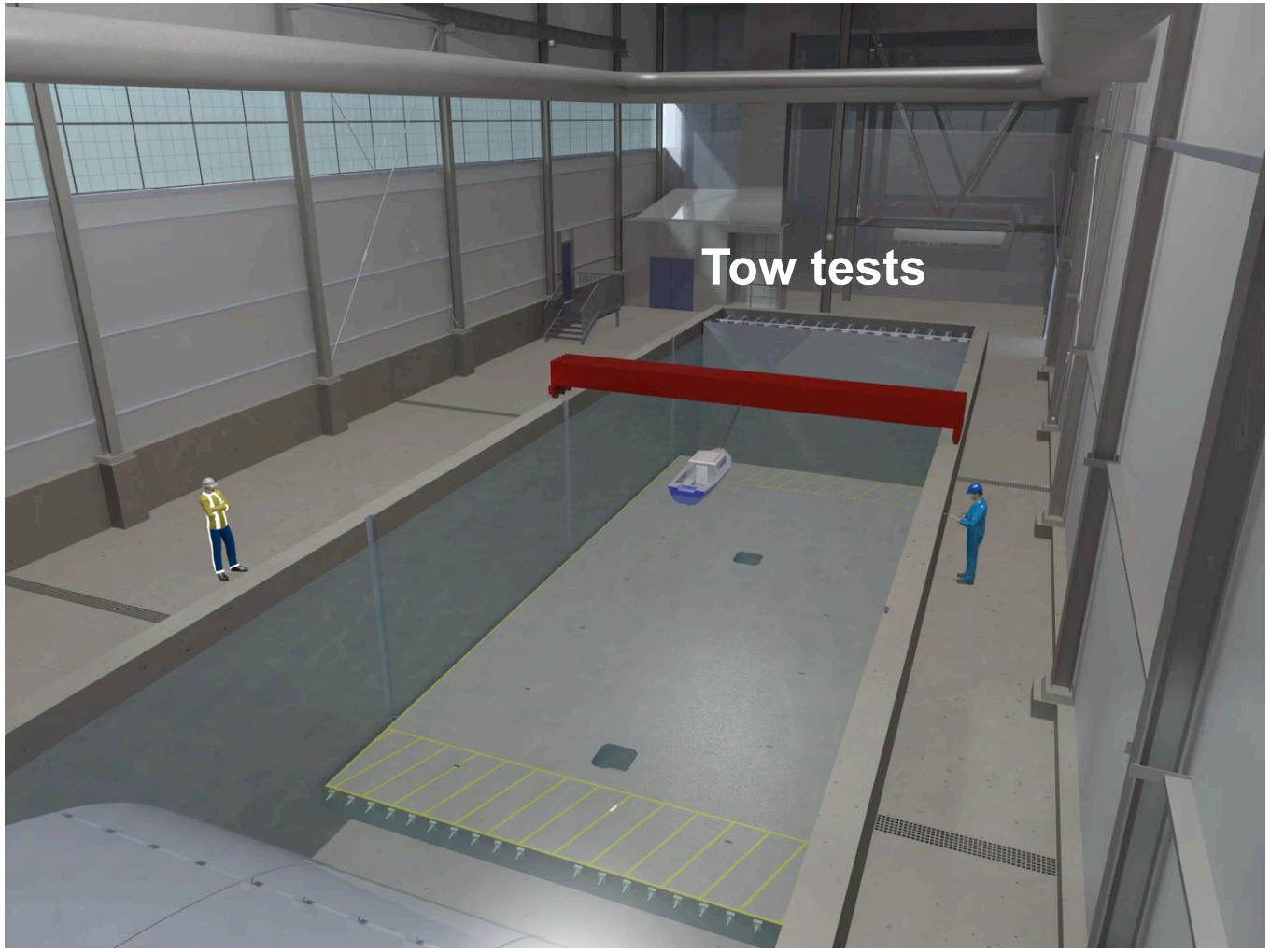
W^2 Beach system

- Parabolic profile beach
- Detailed design and construction done in house.
- Aluminum ribs
- Composite surface
- Removable central structure to accommodate towing system

Wavemaker and Beach

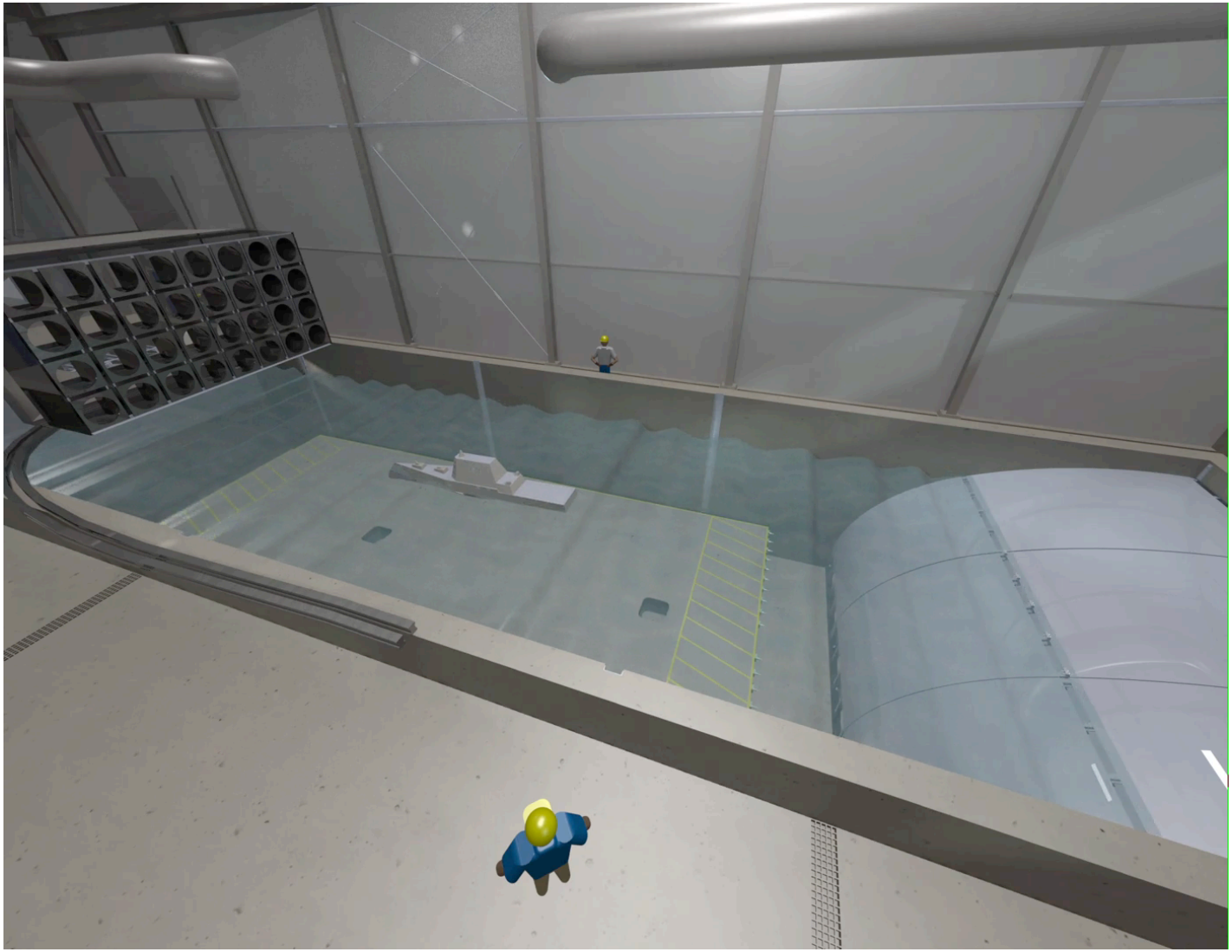
Sea-keeping tests of new vessels

video

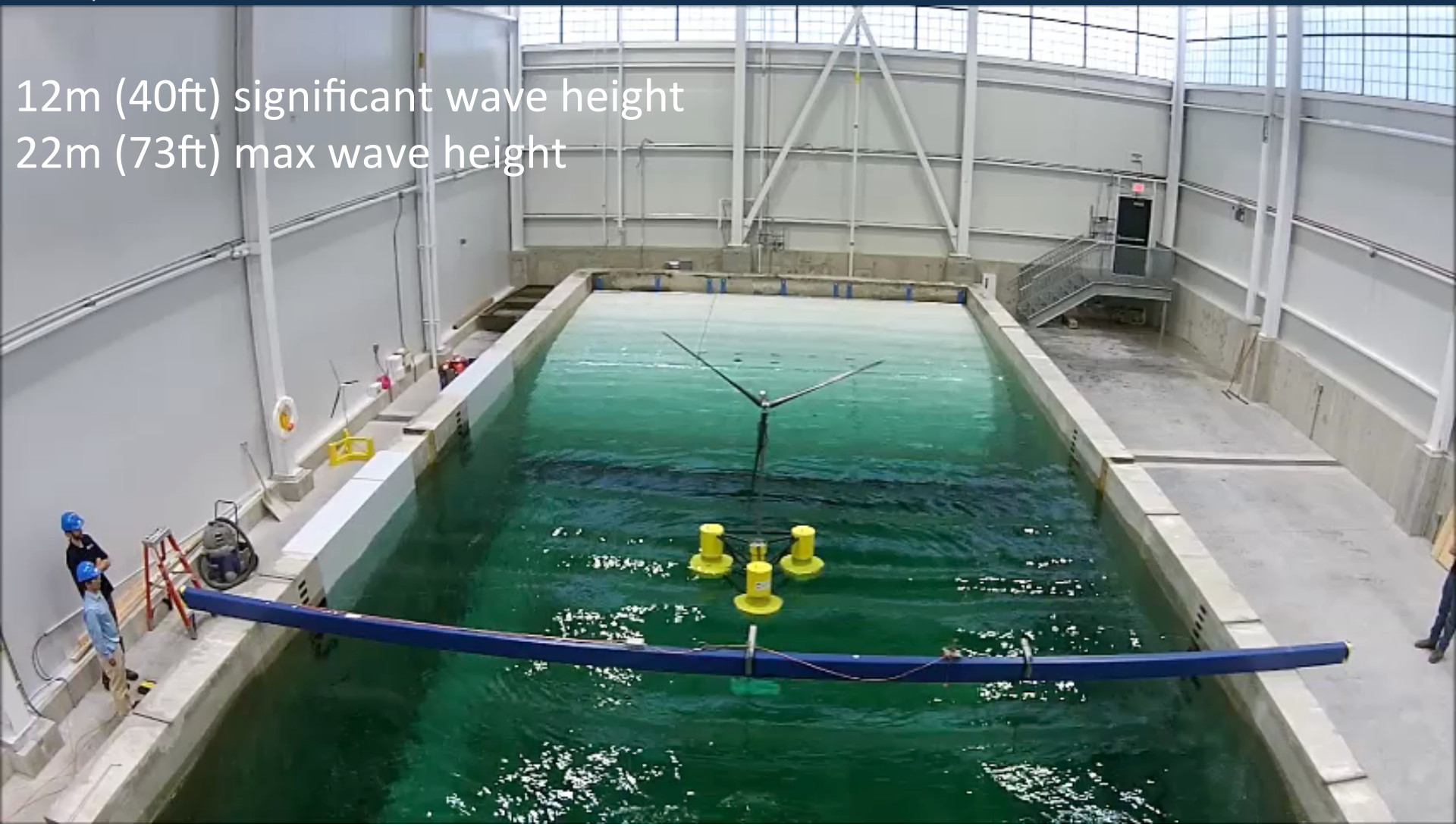


Navy/Coast Guard vessels

video



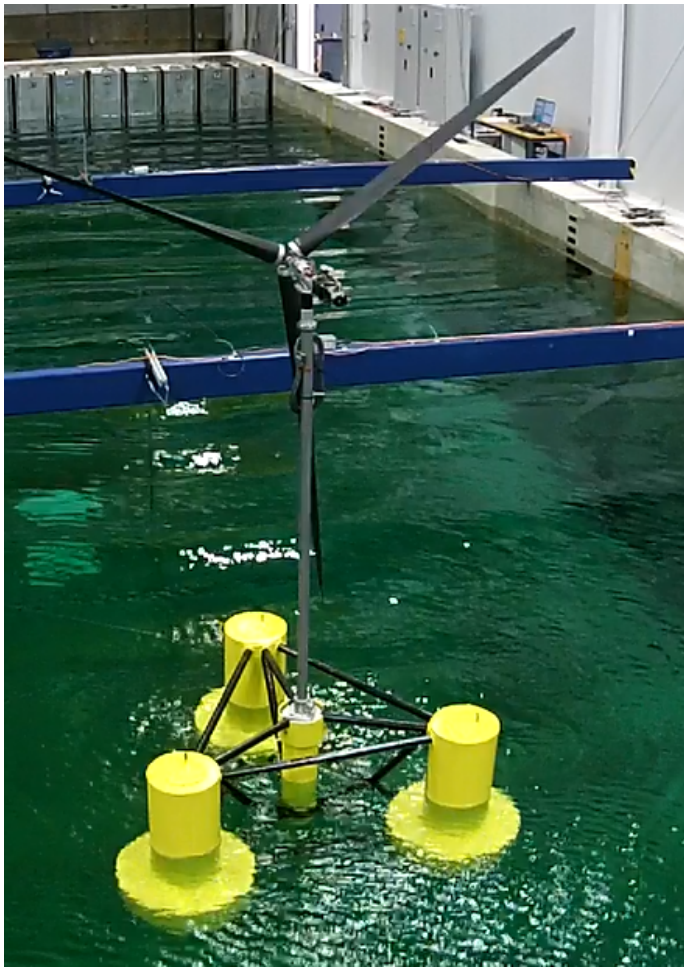
500-year Survival
Waves- Rotor Idling




FORTUS
3D PRODUCTION SYSTEMS

Summary

1. W^2 Wind Wave Facility Completed in June 2015
   - Waves maker completed
   - Wind machine completed by end 2015
   - Moving floor and tow carriage available in 2016
   - Advanced manufacturing capabilities
2. Funded by NSF, Department of Commerce, and the State of Maine
3. Goal: help to develop new technologies
   - Aquaculture
   - Offshore wind
   - Oil and Gas
   - Ships
   - O&M
   - Installation



Questions?

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